

systems do not account for actual post-occupancy energy use.<sup>5</sup> Household energy consumption, while dependent on building envelope and appliances, is also crucially dependent on occupants' behavior and use patterns. As Stein and Myer (2000) point out, while Energy Star certification is a useful predictor of a home's relative energy efficiency, the difference between a homeowner's expected/modeled and realized energy savings may vary. This consideration plays an important role in qualifying the conclusions drawn in this study. Nevertheless, Energy Star-certified houses are, on average, expected to save energy compared to conventional homes.

### **Financing Energy Efficiency in the Residential Sector**

Promoting energy efficiency in the residential sector requires providing mechanisms to offset the higher upfront cost generally associated with energy efficiency measures. While many of these measures have a reasonable payback period, some barriers, such as transaction costs and information asymmetries, prevent rapid and widespread adoption of energy efficiency (Gillingham, Newell, and Palmer 2009). Part of the challenge for both public and private-sector programs is to provide mechanisms, including innovative financing mechanisms that will overcome these barriers. The value of the U.S. housing stock is about \$14.5 trillion.<sup>6</sup> If we assume that 2% of this value is required for efficiency improvement in the residential sector, public and private outlays add up to \$300 billion.

One of the ways in which energy efficiency is financed is through grants geared towards energy efficiency retrofits. A well-known and long running program is the Weatherization Assistance Program (WAP) that offers grants to qualified low-income families for the purpose of weatherization. State-sponsored energy

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<sup>5</sup> This is true for the residential sector. Energy Star ratings for non-residential sector rely on building performance by comparing the actual energy use to other buildings of similar type in that year.

<sup>6</sup> Replacement cost value of U.S. housing stock: Federal Reserve Board's Flow of Funds Accounts, December 6, 2012, Table B.100 (line #43). This figure includes homes with and without underlying mortgages.